

# Yuchong Pan

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## CONTACT INFORMATION

MIT, Room 2-333A  
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## RESEARCH INTERESTS

Algorithms, combinatorics, optimization, theoretical computer science, graph theory.

## EDUCATION

### **Massachusetts Institute of Technology**

Ph.D., Applied Mathematics, expected 2026  
◦ Advisor: Michel X. Goemans

### **University of British Columbia**

B.Sc., Computer Science and Mathematics, Honours, with Distinction, 2021  
◦ Thesis: *Optimization Problems on Network Flows with Degree Constraints*  
◦ Advisor: F. Bruce Shepherd

## EMPLOYMENT

### **Massachusetts Institute of Technology**

Assistant Director and Residential Counselor for  $\sqrt{\text{mathroots}}$ , Oct 2023–Jul 2024  
Research Assistant, Sep 2023–Dec 2023  
Mentor for RSI, Jun 2023–Aug 2023  
Residential Counselor for  $\sqrt{\text{mathroots}}$ , Jun 2023–Jul 2023  
Graduate Teaching Assistant and Grader, Feb 2023–May 2023  
Mentor for PRIMES-USA, Jan 2023–present  
Mentor for DRP, Jan 2023–Feb 2023  
Graduate Teaching Assistant and Grader, Sep 2022–Dec 2022  
Mentor for SPUR+, Jun 2022–Aug 2022  
Mentor for DRP, Jan 2022–Feb 2022

### **University of British Columbia**

Research Assistant, Apr 2021–Aug 2021  
Undergraduate Teaching Assistant, Jan 2021–Apr 2021  
Undergraduate Teaching Assistant, Aug 2020–Dec 2020  
Undergraduate Academic Assistant, Oct 2019–Mar 2020  
Undergraduate Teaching Assistant, Sep 2019–Dec 2019  
Student Assistant, Centre for Accessibility, Jan 2019–Apr 2019  
Undergraduate Teaching Assistant, Sep 2018–Dec 2018

### **Microsoft Corporation**

Software Engineer Intern, May 2020–Aug 2020  
Software Engineer Intern, Jun 2019–Aug 2019  
Software Engineer Intern, May 2018–Aug 2018

### **Sogou, Inc.**

Software Engineer Intern, May 2017–Jul 2017

## InitialView

Software Engineer Intern, Aug 2016–May 2017

## TEACHING EXPERIENCE

### Massachusetts Institute of Technology

*Teaching Assistant*

18.453/4531 Combinatorial Optimization (graduate), Spring 2023  
18.085 Computational Science and Engineering I, Fall 2022

### University of British Columbia

*Teaching Assistant*

CPSC 420 Advanced Algorithms Design and Analysis, Spring 2021  
CPSC 311 Definition of Programming Languages, Fall 2020  
CPSC 421/501 Introduction to Theory of Computing (graduate), Fall 2019  
CPSC 121 Models of Computation, Fall 2018

*Academic Assistant*

CPSC 411 Introduction to Compiler Construction, Fall 2019–Spring 2020  
*Involved in the redesign of the course, supervised by William J. Bowman.*

## MENTORING EXPERIENCE

### Massachusetts Institute of Technology

Research Science Institute (RSI), Jun 2023–Aug 2023.

- Student: Alan Bu (high school)
- Topic: Connections Between Concatenations of Two Incidence Matrices and Spanning Trees in Planar Graphs
- Selected as one of the top 5 oral presentations among 100 presentations

Research Science Institute (RSI), Jun 2023–Aug 2023.

- Student: Deyan Hadzhi-Manich (high school)
- Topic: Lower and Upper Bounds on Longest Geometrically Increasing Sequences

Program for Research in Mathematics, Engineering and Science for High School Students (PRIMES-USA, remote), Jan 2023–present.

- Student: Ruiyang (Raymond) Luo (high school)
- Topic: Cyclic Basis Orderings of Matroids

Directed Reading Program (DRP), Jan 2023–Feb 2023.

- Students: Tianze Jiang, Wayne Zhao
- Book: *Beyond the Worst-Case Analysis of Algorithms* edited by T. Roughgarden

Extended Summer Program in Undergraduate Research (SPUR+), Jun 2022–Aug 2022.

- Students: Evgeniya Artemova, Christina Yu
- Topic: Lower Bounds on the Discrete Newton's Algorithm for the Submodular Line Search Problem

Directed Reading Program (DRP), Jan 2022–Feb 2022.

- Students: Sualeh Asif, Aparna Gupte
- Book: *Randomized Algorithms* by P. Raghavan and R. Motwani

## VOLUNTEERING EXPERIENCE

### THE Hack (InnoCat Technology Co., Ltd.)

Co-Founder, Chief Technology Officer and Co-Director of Corporate Relations, Feb 2017–Jul 2018.

### Shaoxing No.1 High School

Coach for Competitive Programming Summer Camp, July 2016–July 2016  
Student Lecturer on Competitive Programming, 2013–2015

MANUSCRIPTS

- On the maximum number of spanning trees in a planar graph with a fixed number of edges: a linear-algebraic connection (with A. Bu). *In preparation*.
- A counterexample to box-half-integrality of the intersection of crossing submodular flow systems (with M.X. Goemans). 2023. *Unpublished*.
- Optimization problems on network flows with degree constraints. Undergraduate honours thesis, University of British Columbia, 2021.

EXPOSITORY  
ARTICLES

- $r$ -arborescences, spanning trees, extended formulations and total dual integrality (with D. Jin). Project of MIT 18.456J (Algebraic Techniques and Semidefinite Programming), 2023.
- From bounded degree to bounded arboricity (with J. Rodríguez Figueroa). Project of MIT 6.5240 (Sublinear Time Algorithms), 2022.
- Randomization in recent progress on traveling salesman problem. Project of MIT 6.842 (Randomness and Computation), 2022.
- Summary: round trip spanners and roundtrip routing in directed graphs. Project of MIT 6.890 (Graph and Matrix Algorithms), 2021.
- A spectral method for the sensitivity conjecture. Project of UBC CPSC 531F (Topics in the Theory of Computing: Applications of Linear Algebra), 2021.
- Unsplittable flow problem on paths and trees: closing the LP relaxation integrality gap (with A. Jozefiak). Project of UBC CPSC 531F (Tools for Modern Algorithm Analysis), 2019.

TALKS AND  
PRESENTATIONS

- Fantastic spanning trees in planar graphs and where to find them. Simple Person's Applied Math Seminar (SPAMS), MIT Department of Mathematics. Cambridge, MA. October 12, 2023.
- Perturbation-stable maximum cuts. Algorithms Reading Group, UBC Department of Computer Science. Online. June 30, 2020.

HONORS AND  
AWARDS

- Graduation with Distinction, University of British Columbia, 2021.
- Science Scholar, University of British Columbia, 2021.
- Dean's Honour List, University of British Columbia, 2021.
- Work Learn International Undergraduate Research Award (CAD \$6,000), University of British Columbia, 2021.
- Stanley M Grant Scholarship in Mathematics (CAD \$1,500), University of British Columbia, 2021.
- Faculty of Science International Student Scholarship (CAD \$7,500), University of British Columbia, 2020.
- J Fred Muir Memorial Scholarship in Science (CAD \$200), University of British Columbia, 2020.
- Trek Excellence Scholarship (CAD \$4,000), University of British Columbia, 2020.
- Science Scholar, University of British Columbia, 2020.
- Dean's Honour List, University of British Columbia, 2020.
- Faculty of Science International Student Scholarship (CAD \$5,000), University of British Columbia, 2019.
- Dean of Science Scholarship (CAD \$350), University of British Columbia, 2019.
- Trek Excellence Scholarship (CAD \$4,000), University of British Columbia, 2019.
- Stanley M Grant Scholarship in Mathematics (CAD \$1,500), University of British Columbia, 2019.
- Science Scholar, University of British Columbia, 2019.
- Dean's Honour List, University of British Columbia, 2019.

- Faculty of Science International Student Scholarship (CAD \$10,000), University of British Columbia, 2018.
- Dean of Science Scholarship (CAD \$425), University of British Columbia, 2018.
- Trek Excellence Scholarship (CAD \$4,000), University of British Columbia, 2018.
- Marie Kendall Memorial Scholarship in Science (CAD \$925), University of British Columbia, 2018.
- Joel Harold Marcoe Memorial Scholarship (CAD \$150), University of British Columbia, 2018.
- Science Scholar, University of British Columbia, 2018.
- Dean's Honour List, University of British Columbia, 2018.
- 27th Place (out of 118 teams), North American Invitational Programming Contest, Open Division (USA + Canada), 2018.
- 11th Place (out of 67 teams), ACM International Collegiate Programming Contest, Pacific Northwest Regional (Division 1), 2017.
- Outstanding International Student Award (CAD \$6,000), University of British Columbia, 2017.
- Silver Medal, National Olympiad in Informatics Top Competition, China Computer Federation, 2015.
- Bronze Medal, Asia-Pacific Informatics Olympiad, China Computer Federation, 2015.
- First Prize, National Olympiad in Informatics in Provinces (Grades 10–12 Division), China Computer Federation, 2014.
- First Prize, National Olympiad in Informatics in Provinces (Grades 10–12 Division), China Computer Federation, 2013.
- Second Prize, National Olympiad in Informatics in Provinces (Grades 7–9 Division), China Computer Federation, 2012.
- Second Prize, National Olympiad in Informatics in Provinces (Grades 7–9 Division), China Computer Federation, 2011.

PROFESSIONAL  
SERVICE

*Journal Review*

SIAM Journal on Discrete Mathematics (SIDMA)

*Conference Review*

ACM-SIAM Symposium on Discrete Algorithms (SODA), 2022

RELEVANT SKILLS

Languages: English, Mandarin

Programming:  $\text{\LaTeX}$ , Python, Julia, C/C++, Java, C#, MATLAB, JavaScript, Go, Racket, Standard ML, MySQL

LAST UPDATED

October 30, 2023